Investigating Ecosystems

Dynamic Ecosystems

Student Trail

Werribee Open Range Zoo

Investigating the Grassland Ecosystem

Student Trail

VCE Biology Unit Two: Organisms in their environment

Area of Study Two: Dynamic Ecosystems

Outcome Two: Fieldwork Report

Introduction

I*nvestigating the Grassland Ecosystem* explores the diversity that exists within grasslands. The program provides students with an opportunity to collect data to meet the requirements of the School Assessed Coursework (SAC) in the form of a fieldwork report. Students will be guided through activities that involve observation; monitoring of biotic and abiotic factors; and the collection and analysis of data.

Aims:

Students will have the opportunity to:

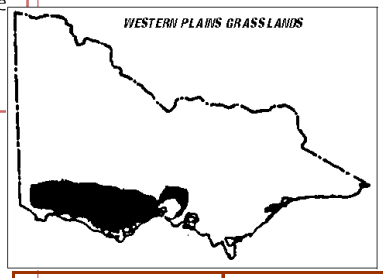
- identify and describe relationships between living and non-living components of an ecosystem
- consider the factors that affect the distribution and abundance of organisms
- consider the impact of human activity on the sustainability of the grassland ecosystem and suggest action for their conservation
- utilise techniques for obtaining fieldwork data on ecosystems.

Did you know?

Werribee Open Range Zoo is located within the Western Basalt Plains. This grassland ecosystem used to cover approximately one third of Victoria, bounded by Melbourne to the east, Hamilton to the south, Beaufort to the north and Colac to the west.

Part A: The Discovery Session

The Grassland Ecosystem in the Volcanic Plains



1.As you move through the Volcanic Plains observe the **biotic** and **abiotic** components of the grassland ecosystem. In the table below record any evidence of three organisms that you have observed. Classify the organisms as **producers** or **consumers** and record their inputs and outputs.

Organism	Evidence	Producer or consumer? Circle	Inputs	Outputs
		Producer Primary consumer Secondary consumer Tertiary consumer		
		Producer Primary consumer Secondary consumer Tertiary consumer		
		Producer Primary consumer Secondary consumer Tertiary consumer		

2. In terms of plant **succession**, suggest why the grasslands of the Western Volcanic Plains have not been succeeded by woodlands.

Valuable Grasslands

Aboriginals living within the Western Volcanic Plains utilised many of the **indigenous** grassland species for food and medicines.

3. Record an example of a grassland species utilised by the Aboriginals.

Plant name: _____

Use: _____

Golden Sun Moth

Synemon plana

You would be very lucky to observe the Golden Sun Moth (*Synemon plana*) as the adult stage of their life cycle lasts four days during November/December and they are only active in sunny conditions. Their larvae stage spans over two years, but all of this time is spent underground feeding on the roots of grasses.

4. A great deal of the Zoo's resources including time, labour and money have been put into conserving the Golden Sun Moth, a species that will rarely be seen by visitors to the Zoo. Explain why it is important to conserve species such as these.

Golden Sun Moth - What are the threats?

The Golden Sun Moth (*Synemon plana*) is only found in Wallaby Grass *Danthonia sp.* grasslands. They were once widespread throughout Australia, but due to the destruction of grasslands are now classified as Endangered by ANZECC and are protected under the *Victorian Flora and Fauna Guarantee Act,1988*

Threatened Grasslands

Grasslands are considered to be one of the most threatened ecosystems in Australia. Only 0.1% of the original Western Volcanic Plains grasslands remain. They are listed as Threatened under the *Victorian Flora and Fauna Guarantee Act 1988* and are currently being considered for listing under the *Environment Protection and Biodiversity Conservation Act 1999*, which is a step towards promoting their recovery.

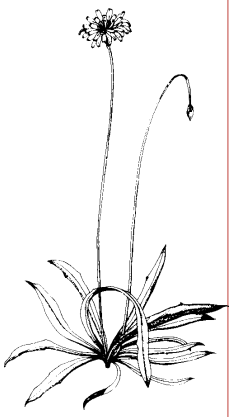
5. List the factors that are responsible for the loss of grasslands.

Did you know?

Grasses grow from the base of the plant rather than from the tips as found in other types of plants. Therefore grasses are able to survive low intensity grazing and mowing. They will just keep growing back!

Did you know?

Grassland remnants are now restricted to cemeteries, road and railway reserves and on private property. Twenty one species of vertebrates originally found in the Victorian grasslands no longer exist in Victoria. Six of these species are extinct.



6. Zoos Victoria has conservation programs for a number of species indigenous to the Western Volcanic Plains. List the species involved below.

_____

_____

_____

Take a closer look

Identifying grasses

Grasses and grassy plants are usually herbaceous (non woody) flowering plants less than two metres in height, with long thin leaves, parallel veins and a fibrous root system. Five distinct groups are present in the Volcanic Plains area.

7a. Identify a plant species within the area you are observing. Make a field sketch of the plant or characteristic part(s), eg. seeds, flowers, leaf shapes, in the space provided.

7b. Record one structural adaptation observed on the plant that enables it to survive the low amount of rainfall that occurs in this region. Explain how you think this **adaptation** helps the plant to survive.

Plant family: _____

Plant name: _____

Adaptation: _____

_____

_____

_____

_____

Environmental Conditions:

8. Record the type of climate that Victorian volcanic plains grasslands tend to be located within.

Precipitation range: _____

Temperature range: _____

9. Record the current environmental conditions:

Date: _____

Time: _____

Temperature (circle): Hot Warm Cool Cold

Precipitation (circle): None Light Heavy Constant Intermittent

Cloud Cover: _____ % cover

Wind Force: _____ (refer to the Beaufort Wind Scale Below)

Force	Speed (km/hr)	Wind	Definition
0	0-2	Calm	Smoke rises vertically
1	3-5	Light air	Smoke slowly drifts
2	6-11	Light breeze	Wind felt; leaves gently rustle
3	12-18	Gentle breeze	Leaves in continuous movement: flags flap
4	19-26	Moderate breeze	Dust and paper blown about: small branches in motion
5	27-34	Fresh breeze	Small trees in leaf sway: crested wavelets form on inland
6	35-43	Strong breeze	Branches in motion, whispering in telephone wires
7	44-53	Moderate gale	Whole trees sway
8	54-64	Fresh gale	Twigs and small branches broken off trees; progress impeded
9	65-77	Strong gale	Large branches broken off: slight structural damage to houses
10	78-90	Whole gale	Trees uprooted; roof damage
11	91-104	Storm	Rarely experienced inland

Quadrat Survey

10. You will be conducting **quadrat** surveys to determine the density and abundance of species within the Zoo's Volcanic Plains exhibit. The data you gather could be compiled together with other members within your class and analysed back at school. Work in a team of 2-3 students and complete the details in the quadrat table on the next page.

Cover Class

Cover class is calculated by estimating what percentage of the area studied is covered by a particular species and converting it to a cover class using the table below:

Cover class	Percentage
5	75%-100%
4	50%-75%
3	25%-50%
2	5%-25%
1	1%-5%
+	less than 1%

Density

Density of plants = no. of plants of the same species / area(m^2)

Quadrat Survey:

Names of group members: _____

Date: _____ Location: _____

Quadrat size: _____ Study area size: _____

Landform: _____ Geology: _____

Soil type: _____ Vegetation community: _____

Quadrat 1			
Aspect: (circle) N/S/E/W			
Slope: (circle) steep/moderate/flat			
Humidity:			
Canopy cover:			
Species:	Total no	Density (/m²)	Cover class

Groundlayer:	% cover
Rocks	
Logs	
Plant litter	
Branches	
Bare ground	
Water	

Evidence of animals:

Vegetation quality: (circle)
Pristine/Intact/Disturbed/Very disturbed

Notes:

Quadrat 2			
Aspect: (circle) N/S/E/W			
Slope: (circle) steep/moderate/flat			
Humidity:			
Canopy cover:			
Species:	Total no.	Density (/m²)	Cover class

Groundlayer:	% cover
Rocks	
Logs	
Plant litter	
Branches	
Bare ground	
Water	

Evidence of animals:

Vegetation quality: (circle)
Pristine/Intact/Disturbed/Very disturbed

Notes:

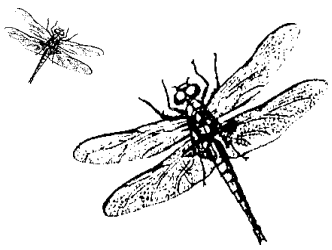
Quadrat 3			
Aspect: (circle) N/S/E/W			
Slope: (circle) steep/moderate/flat			
Humidity:			
Canopy cover:			
Species:	Total no.	Density (/m²)	Cover class

Groundlayer:	% cover
Rocks	
Logs	
Plant litter	
Branches	
Bare ground	
Water	

Evidence of animals:

Vegetation quality: (circle)
Pristine/Intact/Disturbed/Very disturbed

Notes:



Part B: On Safari

Grasslands of the World

The animals represented at Werribee Open Range Zoo are from the grasslands of the world. Some of these species are in decline partly due to the destruction of their grassland habitat.

11. As you move around the Zoo on safari, record in the table below, the animals that are threatened by the destruction of habitat. Record the country they are from and if the Zoo has a breeding program for them.

Animal	Country	Breeding program?

Eastern Grey Kangaroo

Macropus giganteus

Some species of kangaroo including the Eastern Grey, Red and Western Grey Kangaroos have flourished since human settlement, benefiting from the clearing of land for pastures, which they feed on, and the development of dams. They are so common in some regions that they are considered to be a **pest.**

12. How can the large population size of a particular species such as the kangaroo impact upon the **diversity** of a grassland ecosystem?

_____

_____

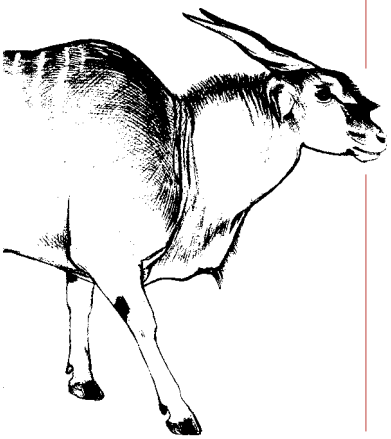
_____

_____

All kangaroo species are protected. However, if the numbers of a particular species are assessed as exceeding ecological **sustainable** levels they are harvested by licensed people. Within a natural ecosystem a number of factors may interact to prevent the **overpopulation** of a species.

13. List the factors that may keep kangaroo numbers down within their natural habitat.

Lower savanna



14. Observe the range of animals within the lower savanna. Record one example of **symbiosis**.

15. All of the animals observed in the lower savanna are herbivores from the African savanna. Describe the **niche** that two different species occupy to avoid competition for their food source.

Animal	Feeding Niche

Back at School

Data Analysis

16. Prepare a relationship web that illustrates the interrelationships between different kinds of organisms in the Volcanic Plains grassland ecosystem, and between organisms and their non-living surroundings.

17. Weeds are a constant issue within the grassland ecosystem at Werribee Open Range Zoo. The horticulture team manages weeds through the use of **biodegradable herbicides**. Explain why it is important that we only use biodegradable herbicides.

_____

_____

_____

Quadrat Survey Analysis

18. Compile your class results into the table below.

Calculate the density and abundance of each species within the Volcanic Plains area that was studied. Refer to the formulas below.

$$\text{Species density} = \frac{\text{no. of plants of the same species}}{\text{Total area studied } (m^2)}$$

$$\text{Species abundance} = \frac{\text{no. of plants of the same species}}{\text{Total no. of plants}} \times 100$$

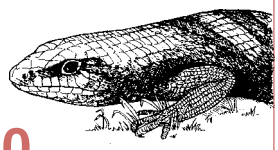
Species	No. of individuals	Species density (/m^2)	Species abundance (%)
Total no: =			

18a. Based on the collated class data, which species appears to be the dominant species within the Zoos grassland ecosystem? Give reasons for your answer.

_____

_____

_____



18b. How does the collated class data compare to your individual data?

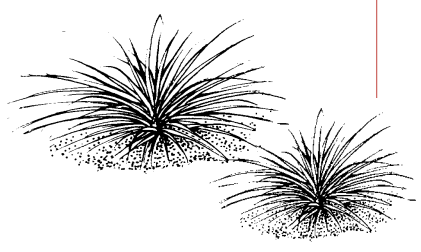
19. Comment on the effectiveness of using quadrat survey techniques to determine the abundance and density of plants within an area.

19a. Refer to how you rated the vegetation quality within your quadrat table. How did you generally rate your quadrats, ie pristine, intact, disturbed or very disturbed?

19b. Using data compiled from the whole class how would you rate the ecosystem as a whole?

19c. Suggest some management strategies that could be used to improve the quality of the ecosystem within the study area.

20. Explain the role the ground cover plays within the grassland ecosystem.



Conclusion

21. Describe the ecosystem you have considered during this fieldwork activity.

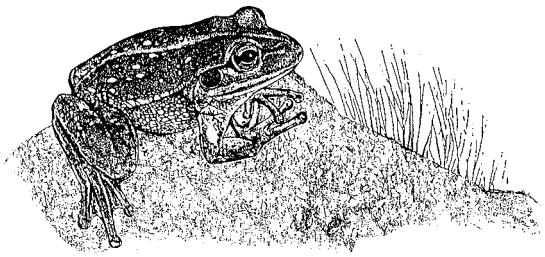
22. Provide one example of each of the following factors to explain how they are likely to affect the distribution and abundance of organisms in the ecosystem.

a. An **abiotic** factor:

b. A **biotic** factor:

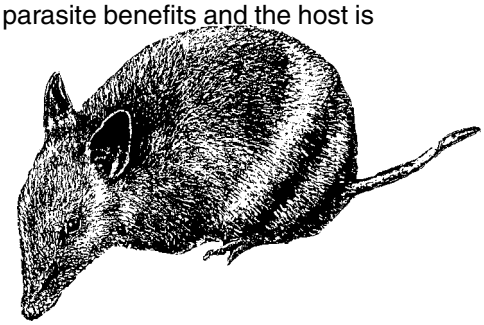
23. Suggest the importance of the different **biotic** and **abiotic** factors in this ecosystem. (Hint: Look back to your relationship web on page 9 – consider the consequences to this system if one factor is removed).

24. State at least 3 actions that you could take to conserve the grassland ecosystem.



Glossary

Abiotic:	A non-living thing.
Adaptation:	A feature that enables an organism to survive. The adaptation may be structural, behavioural or physiological.
Biodegradable:	A substance that is capable of being broken down by an organism such as bacteria.
Biotic:	A living thing.
Carnivore:	An animal that consumes meat.
Consumer:	An organism that consumes food to obtain its energy requirements.
Diversity:	Variety.
Ecosystem:	is the interaction between living (biotic) and non-living(abiotic) components.
Herbicide:	A toxic substance used to destroy unwanted plants.
Herbivore:	An animal that consumes plant material.
Indigenous:	An organism that has originated naturally from a place.
Niche:	Refers to an animal's way of life within its habitat. The niche of a species can be described to include its diet, feeding techniques, pattern of daily activity, temperature range tolerated, etc.
Overpopulation:	Occurs when there are not enough resources to support a population of organisms.
Pest:	A species that exploits or disrupts the natural balance of an ecosystem.
Producer:	An organism that manufactures its own energy supply, eg. a plant.
Quadrat:	A quadrat is a small area marked out randomly within a study site. It is a sampling technique used to give an idea of the frequency, distribution and type of species present within an area. A detailed study can be made of the area within the quadrat and data collected. The data gathered can be collated with other groups studying the area and analysed to give an overall picture of the study area. Quadrat surveys save a lot of time and effort compared to physically collecting data from the entire study site.
Succession:	The gradual replacement of one plant community with another.
Sustainable:	Maintaining an ecological balance by avoiding the depletion of resources.
Symbiosis:	The relationship between two organisms where at least one of the organisms benefits from the relationship.
	Different forms of symbiosis:
	Commensalism is a relationship where the parasite benefits and the host is unaffected
	Mutalism is where both of the host and parasite benefit
	Parasitsim is where the parasite benefits and the host is adversely affected.



ZOOS VICTORIA

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For further information on what we have to offer refer to our website

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